REMARKS

Claims 1-35 and 41-97, as amended, remain herein. Claims 3, 8, 17 to 35, 41 to 59, 65, 68 to 86, 88 and 90 have been amended hereby.

This Preliminary Amendment to amend the specification and claims to conform to the Article 36 Amendment filed in the corresponding International Application and to correct errors which occurred during translation to the Japanese text into the English language.

Examination of this application on its merits is respectfully requested.

Respectfully submitted,

PARKHURST & WENDEL, L.L.P.

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Date

Roger W. Parkhurst
Registration No. 25,177

Attachment:
Mark Up of Amended Specification and Claims

RWP/ame

Attorney Docket No.: OGOH:113

PARKHURST & WENDEL, L.L.P.
1421 Prince Street, Suite 210
Alexandria, Virginia 22314-2805
Telephone: (703) 739-0220

of a conductive layer such as ITO on its top surface, then a glass substrate, a light-blocking layer, a color filter, an over-coating layer, and an orientation film and there are no sites at which the electrodes (conductive substances) are exposed, so that ions or ionized components, which are the cause of black spot defects, are not recovered at all by the color filter side substrate. Accordingly, ions and the like are reliably, and almost entirely, eliminated by some sort of means.

First, in the first inventive group, the fact is exploited that when in in-plane electric field mode liquid crystal elements the total thickness of the insulating layer (film) and the orientation film on the electrodes is extremely thin, the ions and charges in the liquid crystal layer are eliminated through narrow holes, for example, occurring in the insulating film, and that as a result, black spots substantially no longer occur.

A first invention of this inventive group is characterized in that there is a third layer, between a metal layer composed of the electrodes or the signal lines and the liquid crystal layer, which is made of an insulating layer and an orientation film, or a protective film, for example, that may also serve as these films, and there are regions in which the thickness of the insulating layer and the orientation film together is less than 1000 Å and preferably less than 500 Å. Here, an electrode in a pure in-plane electric field mode element refers to the pixel electrode and the storage electrode or common electrode associated (accompanying) therewith. In-plane electric field elements falling under a broader definition, such as HS, further include other electrodes, for example. Also, it

is even better if the total film thickness of the insulating layer and the orientation film, for example, between the pixel electrode and the liquid crystal layer and the common electrode and the liquid crystal layer is less than 500 Å, or if there are sections without these layers. It should be noted that if there is no orientation film or if there are regions in which there is partially no orientation film, then in these areas it may be preferable that some other orienting means has been devised. Of course, if below a black matrix (opposite the user side), for example, then such measures are not necessary. Moreover, in line with future technological advances, a liquid crystal material that does not require an orientation film may also be used.

Hereinafter, in the inventions,

Similarly, it is characterized in that the light-blocking film, such as a black matrix, is conductive. Furthermore, it is characterized in that this conductive light-blocking film is formed on the opposing substrate. Furthermore, it is characterized in that the orientation film or the protective film are films of a conductive substance.

Thus, ions and ~~the electric field~~ charges in the liquid crystal are shifted and ions or charges in the liquid crystal molecules and the liquid crystal layer are eliminated and the misalignment, for example, of liquid crystal molecules at defective insulating portions, for example, is also eliminated, and thus, a favorable display is attained.

In addition to the above, for example an insulating film for preventing short circuits or a protective film also serving as an

invention.

Fig. 72 is a diagram of a modified example of the array side substrate of this embodiment.

Fig. 73 shows the structure of the array side substrate of the liquid crystal element according to Embodiment 2-7-4 of the present invention.

Fig. 74 is a diagram showing a modified example of the array side substrate of this embodiment.

Fig. 75 shows the structure of the array substrate side of the liquid crystal element according to Embodiment 2-7-5 of the present invention.

Fig. 76 is a diagram of a modified example of the array side substrate of this embodiment.

Fig. 77 shows primarily the array substrate side of the liquid crystal element of Embodiment 2-7-6 of the present invention.

Fig. 78 shows configuration in the major aspects of Embodiment 2-8-1 of the present invention.

Fig. 79 shows the configuration of the major components of a reflective liquid crystal display device adopting the present invention.

Fig. 80 is a diagram of the configuration of a liquid crystal optical logic element adopting the present invention.

Fig. 81 is structural diagram of ~~a LE~~ an EL display adopting the present invention.

Fig. 82 shows a modified example of Embodiment 1-2-1 of the present invention.

Fig. 83 shows a modified example of the various

First ~~Major~~ Inventive Group

This major inventive group is made up of two inventive groups, and relates to a resin for sealing the liquid crystal injection port.

First ~~Major~~ Inventive Group

This inventive group relates to keeping bubbles or the like from entering the UV curable resin or the like used to seal the liquid crystal injection port.

Embodiment 1-1-1

(Here, Embodiment 1-1-1 indicates the first embodiment of the first inventive group of the first major inventive group.)

In the present embodiment, a UV curable resin with low viscosity is selected as the UV curable resin for sealing the liquid crystal injection port. If the resin has a low viscosity, there is a smaller probability that it contains bubbles when applied to the injection port. In particular, a viscosity of 20Pa s or less is even better, because then the resin contains hardly any bubbles.

In a second aspect, warming the substrate side by infrared (I.R.) light, for example, when the UV curable resin is applied to the injection port, or heating by warming only the resin once it has been applied or the entire substrate, has the effect of substantially lowering the viscosity of the resin. Also, if the ~~temperature~~ viscosity of the resin ~~is made~~ becomes a viscosity of no more than 20Pa s due to this heating, then the resin hardly contains bubbles anymore, which is even better.

In a third aspect, the UV curable resin can be warmed in advance to a suitable temperature, for example 70 to 80°C, to lower

insulating film, has been made thin in order to prevent the occurrence of black dot nonuniformities.

The inventions of the present inventive group are described below.

Embodiment 2-1-1

(Embodiment 2-1-1 means the first embodiment of the first inventive group of the second major inventive group.)

The present embodiment will be described below with reference to the drawings.

The liquid crystal element of the present embodiment is shown in Fig. 12. As shown in Fig. 12, the liquid crystal element has a pixel electrode 4 and a common electrode 5 for generating an electric field substantially parallel to the surface of an insulating film 81 formed over the entire surface of an array substrate 1. There is an insulating layer 8 and an orientation film 9 (strictly speaking, in Fig. 12 the top portion of the insulating layer and the orientation film) serving as a third layer between a liquid crystal layer 3 and the metal layer made of the pixel electrode 4, the common electrode 5 and the signal line 6, for example, (strictly speaking, this may also be an electrode made by a non-metal such as ITO; also, in principle the bottom of the insulating material and the orientation film are at an identical height from the substrate surface between the metal lines and the metal electrode) and which are different than the above-mentioned metal layer and liquid crystal layer, and there is a region in which the thickness of the insulating layer 8 and the orientation film 9 together is smaller than 500 Å. More specifically, due to the manufacturing

circumstances, there is another normal insulating film 81 or a protective layer (not shown), for example, above or below the electrodes of the pixel electrode 4, the common electrode 5, and the signal line 6, etc. The total thickness of the insulating layer and orientation film, for example, serving as a third layer interposed between the liquid crystal layer and the metal layer is extremely thin at 1000 Å or less, and is preferably thinner than 500 Å. In the drawing this thickness is 400 Å.

The reason for this is that since the cause of black spot defects lies in lowered voltage holding ratio due to the local concentration of ion species components, the black spot defects can be eliminated by recovering the concentrated ion species via the electrodes. That is, by making the insulating layer and the orientation film above the electrodes as thin as possible, the concentrated ion species are more easily incorporated into the electrodes through these layers or from fine holes in these layers. It should be noted that the region thinner than 500 Å does not necessarily have to be formed over the entire surface of the electrodes, and it is sufficient if there are places that are partially less than 500 Å thick. Of course, the effect is greater when there are many of such regions and when the regions are wide. It should also be noted that both the orientation film and in particular the insulating layer may be composed of several layers.

Aside from the above, although not explicitly shown in the drawing because the drawing would be complicated and because it is obvious, switching elements such as TFTs are provided in a matrix arrangement on the array-side substrate, and the signal

by the irradiation of separate UV light, and is arranged as an extremely narrow strip or in dots (pinhole-shaped), so that it is does not disturb the orientation of the liquid crystal. For this purpose, it is for example possible to match this portion to the position of the black matrix, to use a substance for the electrode that has an orienting property, or to form pinholes by photolithography.

Embodiment 2-1-3

In the present embodiment, electrodes or the like are in contact with the liquid crystal layer via the orientation film 9 only.

The liquid crystal element of the present embodiment is shown in Fig. 14. As shown in this drawing, in this liquid crystal element there is only the orientation film 9 between the liquid crystal layer 3 and the pixel electrode 4, the common electrode 5, or the signal line 6, and this orientation film 9 has regions that are less than 500 Å thick (in the drawing it is 300 Å). More specifically, there is ordinarily an insulating film and a protective film on the pixel electrode 4, the common electrode 5, and the signal line 6, for example, but in this case there is also a portion with regions lacking these films. In this portion there is only the orientation film, whose thickness is less than 500 Å.

Thus, similar to the previous embodiments, the concentrated ion species are recovered via the electrode, and black spot defects are eliminated. That is, the orientation film on the electrode is made even thinner, and concentrated ion species can be taken up even easier by the electrode than in the various previous embodiments.

observed. In the present embodiment, the electrodes are exposed without an insulating layer on the pixel electrode and the source signal line in order to minimize the generation of black dot nonuniformities, even if there are defective portions in the insulating layer on the gate signal line.

The neutralization electrode of this embodiment was formed by a metal with aluminum as its primary component, however, it can also be formed by an electrode material such as ITO.

In Fig. 17, the neutralization electrode 30 is also formed on the source signal line 6, but as partially shown in Fig. 19 (1), it is also possible to form it only on the gate signal line 7 and in such a way that the neutralization electrodes are linked to one another outside the region shown. In this case, the parasitic capacitance formed between the source signal line and the neutralization electrode can be eliminated and delays in the source signal can be kept down.

As partially shown in Fig. 19(2), the neutralization electrode 30 can also be formed removed of the gate signal line 7. In this case, the parasitic capacitance that is formed between the gate signal line and the neutralization electrode can be reduced and gate signal delays can be suppressed. From the standpoint of inhibiting parasitic capacitance and reducing the probability of pinholes, the protective layer formed between the gate signal line and the neutralization electrode is preferably thick and formed at a thickness of at least 2000 Å, and even more preferably formed at a thickness of at least 3500 Å.

Furthermore, a light-blocking material with metal chrome or

a conductive polymer such as polypyrrole as the main constituent can be used for the neutralization electrode, and as shown in Fig. 20, it can be formed such that it blocks light at the gap between the gate signal line 7 and the common electrode ~~3~~<u>5</u> or the gap between the source signal line and the common electrode. In this case, a black matrix doe not have to be formed on the color filter substrate, so that the number of process steps and the cost can be reduced.

Strictly speaking, forming the neutralization electrode makes the surface of the orientation film uneven, and thus a resin may be chosen that can be given an orientation by irradiating UV light.

Comparative Example 1

As a comparative example, a liquid crystal display panel was fabricated that was different from the liquid crystal display panel of the present embodiment only in that a neutralization electrode is not formed after silicon nitride (SiN_x) has been deposited over the entire surface of the pixel portion as a protective layer. A plan view and a cross-sectional view of the array shape in the pixel portion of this panel are the same as those illustrated by Figs. 4 and 5, respectively.

In this comparative example, a laser beam has of course been irradiated onto a portion of the gate signal line to remove the insulating layer of that portion of the gate signal line, so that a defect portion in the insulating layer on the gate signal line is created in model fashion.

The panel was connected to a drive circuit and continually driven in an atmosphere of 60°C temperature, and at 20 hours the

in contact are arranged continuously in stripe-shape in the direction of the signal line or the direction of the scanning line, then there is no movement at all of impurity ions in a horizontal or vertical direction, which is good. Furthermore, as shown in Fig. 61(4), by totally surrounding the periphery of the pixel by a region 205 where the light-blocking layer and the liquid crystal layer are in contact, the greatest effect can be achieved.

Embodiment 2-6-2

In the liquid crystal element of this embodiment, there is an orientation film layer between the light-blocking layer and the liquid crystal layer. That is, the liquid crystal is in direct contact with the orientation film, and the orientation film and the light-blocking film are in direct contact.

Orientation films are ordinarily very thin at 2000 Å or less, and therefore there are many pin holes in an orientation film. Consequently, when there are ionic impurities, which cause black spot defects in the liquid crystal, for example, ~~ions~~ electrons are transferred between the conductive light-blocking film and the ionic impurities, just like when there is no orientation film.

Also, the ionic impurities are readily absorbed because orientation films, especially those used for IPS mode, generally have large polarity. For this reason, the transfer of electrons with the conductive light-blocking film is performed once ionic impurities are absorbed into the orientation film, so that impurity ions can be more efficiently removed.

It should be noted that the shape, positioning, and area, for example, of the region where the light-blocking layer and the liquid

resistance of the liquid crystal smaller than 10^{13} cm.

Embodiment 2-7-2

Fig. 66(1) shows the opposing substrate (glass substrate) configuration of the liquid crystal element of this embodiment.

In the previous first embodiment, the black matrix on the opposing substrate side was configured surrounding the pixel perimeter, but in this embodiment, the black matrix on the opposing substrate side is configured along the signal line (source line) 6.

Apart from that, the present embodiment is the same as the previous first embodiment.

Accordingly, the insulating film on the array substrate was removed and a conductive black matrix for deionization was formed on the opposing substrate side as well, that is, the conductive substance for recovering ions is formed on both substrates and the conductive substance is in direct contact with the orientation film or the liquid crystal, so that it was possible to keep the black dot nonuniformities small.

Next, as shown in Fig. 63, in the present embodiment and in the previous first embodiment, the insulating film on the pixel electrode above the storage capacity was removed, but it is possible to remove the portion thereof over the signal wire electrode or the pixel electrode, or over a portion spanning these electrodes, as shown in Fig. 67.

Also, as shown in Fig. 68, it is also possible to form the common electrode above the pixel electrode and to remove a portion of the insulating film on the common electrode. In this drawing,

nonuniformities can be even better inhibited from occurring than in the previous first embodiment.

It should be noted that in the third embodiment, the opposing substrate side can be formed as shown in Figs. 66 and 70. Furthermore, as shown in Fig. 72, it is also possible to form the insulating film on the scanning line electrode, the signal line electrode, or the scanning line electrode and the signal line electrode on the array substrate side.

Embodiment 2-7-4

Fig. 73 shows the configuration of the liquid crystal element of the present embodiment.

In the previous third embodiment, the scanning line 7 and the common electrode 5 were formed on the glass substrate 1, the first insulating film was formed over these, and the semiconductor layer, the signal line, and the pixel electrode were formed on top of this, but in this embodiment, the signal line 6, the drain, the pixel electrode 4, and the semiconductor layer 16 are formed on the glass substrate 1, the first insulating film is formed over these, and the scanning line ~~6~~7 the common electrode 5 are selectively formed over this.

This means that in the third embodiment, there was no insulating film on a portion of the pixel electrode but the insulating film was formed on the common electrode, whereas in this embodiment, the insulating film is formed on the pixel electrode but no insulating film is formed on the common electrode.

Also, as shown in Fig. 73, the insulating film (passivation film) is formed only above the TFT, which is the switching element,

example azodicarbonamide, N, N-dinitrosopentamethylenetetramine, benzenesulfonylhydrazide, or sodium hydrogencarbonate.

2) The foaming agent is thermally decomposed, which makes the orientation film ~~agent~~ of the base highly porous.

2-1) As necessary, it is given orientation.

3) When the liquid crystal display device is used, ions and impurities, for example, in the liquid crystal are recovered by the electric charge via the wide surface area due to this foamed structure and the neutralization electrode.

Other Embodiments

Above, the present invention was divided into two major inventive groups, which were each further divided into several inventive groups, and described with reference to a transparent type liquid crystal display device as an example of the liquid crystal element thereof, however, the present invention is by no means limited to the above description. That is, the examples provided hereinafter are also possible.

1) Referring to Fig. 79, the liquid crystal element is a reflective type liquid crystal display, wherein numeral 91 is a mirror and numeral 92 is a transparent insulating film. Additionally, the TFT 16, for example, is formed on the transparent insulating film (as in the drawing) or on the opposing substrate side (not shown).

2) The light-blocking layer (film) is not the black matrix between the color filters but a protective film that also serves to prevent TFT malfunctions due to light. In this case, the light-blocking layer can be provided with protrusions/recesses not only in its

CLAIMS

1. A method for manufacturing a liquid crystal element, in which liquid crystal is sandwiched by two substrates above and below it in a space enclosed by a wall, comprising:

a low-viscosity resin application step of applying a resin that has a viscosity of not more than 20 Pa s at a predetermined temperature of at least 40°C and that is cured by electromagnetic waves, such as UV light, in order to seal an injection port, after injecting the liquid crystal into the space;

a foreign matter elimination step of providing the applied resin with a viscosity of not more than 20 Pa s, and accordingly eliminating chemically foreign matter, such as water, air or dust, included therein; and

a low-viscosity UV light curing resin sealing step of curing the resin by irradiating electromagnetic waves, such as UV light, after or together with the foreign matter elimination step.

2. The method for manufacturing a liquid crystal element according to claim 1, wherein the foreign matter elimination step includes a vibration sub-step of applying a predetermined vibration to the sealing resin.

3. The method for manufacturing a liquid crystal element according to claim 2, wherein the vibration sub-step is an ultrasonic/megasonic irradiation vibration sub-step using

ultrasonic or megasonic waves for the vibration applied to the sealing resin.

~~4. The method for manufacturing a liquid crystal element according to claim 1, wherein the foreign matter elimination step comprises:~~

~~a bubble elimination sub-step of contacting and wiping the resin of the injection port portion with a solid to eliminate portions into which bubbles are mixed, which is carried out during or after the low-viscosity resin application step; and~~

~~a reapplication sub-step of reapplying resin.~~

~~5. The method for manufacturing a liquid crystal element according to claim 1, wherein the foreign matter elimination step comprises a low-pressure step of exposing the applied sealing resin to a pressure that is at least lower than atmospheric pressure, which is carried out during or after the low-viscosity resin application step.~~

~~6. The method for manufacturing a liquid crystal element according to claim 1, wherein the foreign matter elimination step comprises an acceleration step of subjecting the resin to an acceleration toward an opposite liquid crystal side, which is carried out after the low-viscosity resin application step.~~

~~7. The method for manufacturing a liquid crystal element according to claim 1, wherein the foreign matter elimination step~~

includes an infrared light irradiation sub-step of irradiating infrared light in order to lower the viscosity of the applied sealing resin by heating it.

8. A liquid crystal element, in which liquid crystal is held by two substrates above and below it in a space enclosed by a wall, ~~comprising:~~

wherein, in a portion that seals the space after filling liquid crystal into it, a resin is used ~~comprised~~ that has a viscosity of not more than 20 Pa s at a predetermined temperature of at least 40°C when it is uncured and that can be cured by electromagnetic waves; and

wherein the cured resin dues not include optically foreign matter, such as water, air or dust.

9. The liquid crystal element according to claim 8, wherein the resin curable by electromagnetic waves is a UV-light curing resin.

10. The liquid crystal element according to claim 8, wherein the resin curable by electromagnetic waves is an anaerobic resin.

11. The liquid crystal element according to claim 8, wherein the resin curable by electromagnetic waves is a resin that softens to 20 Pa s or less at a temperature of 50°C or more.

12. A liquid crystal element, in which liquid crystal is held by two substrates above and below it in a space enclosed by a wall,

predetermined voltage between the three electrodes,

comprising a neutralization electrode for neutralizing a charge of ions in the liquid crystal layer, provided on one or both of the substrates.

16. The liquid crystal element according to claim 13, wherein the neutralization electrode is a conductive light-blocking neutralization electrode, which is made of a conductive material and also serves as a light-blocking film.

17. The liquid crystal element according to claim 13, wherein the neutralization electrode contacts the liquid crystal layer directly, ~~via the orientation film(s),~~ via a thin film not thicker than ~~1000~~ 500 Å, or via a film that is transmissive to ions.

18. The liquid crystal element according to claim 16, wherein the neutralization electrode contacts the liquid crystal layer directly, ~~via the orientation film(s),~~ via a thin film not thicker than ~~1000~~ 500 Å, or via a film that is transmissive to ions.

19. An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates;

the liquid crystal element comprising, on a substrate side on which the pixel electrode, etc., are not provided, a light-blocking

film of a structure with protrusions/recesses in a surface on the liquid crystal layer side, and wherein the light-blocking film contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

20. An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates;

the liquid crystal element comprising, on a substrate side on which the pixel electrode, etc., are provided, a light-blocking film of a structure with protrusions/recesses in a surface on the liquid crystal layer side, wherein the light-blocking film contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

21. An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates;

the liquid crystal element comprising, on a substrate side on which the pixel electrode, etc., are not provided, a neutralization electrode of a structure with protrusions/recesses in a surface on the liquid crystal layer side, wherein the neutralization electrode with protrusion/recesses in its surface contacts the liquid crystal

layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

22. An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates;

the liquid crystal element comprising, on a substrate side on which the pixel electrode, etc., are provided, a neutralization electrode of a structure with protrusions/recesses in a surface on the liquid crystal layer side, wherein the neutralization electrode with protrusion/recesses in its surface contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

23. ~~A~~ An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, an opposing substrate in which an opposing electrode is formed in opposition to the pixel electrode, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates, wherein an alignment of the liquid crystal molecules is changed by applying a voltage between the pixel electrode, the common electrode and the opposing electrode;

wherein ~~a surface of~~ the opposing electrode has a liquid crystal layer side surface of a structure with protrusions/recesses.

and moreover this surface of a structure with protrusions/recesses contacts the liquid crystal layer directly, via a thin film not thicker 500 Å, or via a film that is transmissive to ions.

24. ~~A~~ An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, an opposing substrate in which an opposing electrode is formed in opposition to the pixel electrode, and a liquid crystal layer sandwiched via orientation films provided on the inner sides of the two substrates, wherein an alignment of the liquid crystal molecules is changed by applying a voltage between the pixel electrode, the common electrode and the opposing electrode;

the liquid crystal element comprising, on an opposing substrate side on which the pixel electrode, etc., are not formed, a light-blocking film of a structure with protrusions/recesses in a surface on the liquid crystal layer side, wherein the surface of the light-blocking layer with protrusions/recesses contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

25. ~~A~~ An in-plane electric field mode liquid crystal element comprising a pair of substrates on at least one of which a pixel electrode, a common electrode, a signal line and a scanning line are formed, an opposing substrate in which an opposing electrode is formed in opposition to the pixel electrode, and a liquid crystal layer sandwiched via orientation films provided on the inner sides

of the two substrates, wherein an alignment of the liquid crystal molecules is changed by applying a voltage between the pixel electrode, the common electrode and the opposing electrode;

the liquid crystal element comprising, on an opposing substrate side on which the pixel electrode, etc., are formed, a light-blocking film of a structure with protrusions/recesses in a surface on the liquid crystal layer side, wherein the surface of the light-blocking layer with protrusions/recesses contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

26. The in-plane electric field mode liquid crystal element according to claim 19, wherein the light-blocking film is ~~a conductive light-blocking film made of a conductive material~~ made of a conductive resin-based substance.

27. The in-plane electric field mode liquid crystal element according to claim 19, wherein the liquid crystal layer ~~is a low specific resistance liquid crystal layer using~~ uses a liquid crystal with a specific resistance ~~that is lower than 10^{13} Ω • cm~~ of 10^{12} to 10^{13} Ω • cm.

28. The in-plane electric field mode liquid crystal element according to claim 26, wherein the liquid crystal layer ~~is a low specific resistance liquid crystal layer using~~ uses a liquid crystal with a specific resistance ~~that is lower than 10^{13} Ω • cm~~ of 10^{12} to 10^{13} Ω • cm.

29. A color filter used in a display device in which a liquid crystal is driven in in-plane electric field mode;

wherein a surface of a light-blocking film portion on a liquid crystal layer side has a structure with protrusions/recessions, and the surface of the structure with protrusion/recessions contacts the liquid crystal layer directly, via a thin film not thicker than 500 Å, or via a film that is transmissive to ions.

30. The in-plane electric field mode liquid crystal element according to claim 19, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the light-blocking film is at least 0.1 μm.

31. The in-plane electric field mode liquid crystal element according to claim 19, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the light-blocking film is at least 0.3 μm.

32. The in-plane electric field mode liquid crystal element according to claim 26, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the light-blocking film is at least 0.3 μm.

33. The in-plane electric field mode liquid crystal element according to claim 27, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the

light-blocking film is at least 0.3 μm.

34. The in-plane electric field mode liquid crystal element according to claim 21, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the neutralization electrode is at least 0.1 μm.

35. The in-plane electric field mode liquid crystal element according to claim 27, wherein a difference between the recessions and the protrusions in the protrusion/recession structure of the light-blocking film is at least 0.3 μm.

36. The liquid crystal element according to claim 19, wherein the light-blocking film contacts the liquid crystal directly or via the orientation films.

37. The liquid crystal element according to claim 23, wherein the light-blocking film contacts the liquid crystal directly or via the orientation films.

38. The liquid crystal element according to claim 24, wherein the light-blocking film contacts the liquid crystal directly or via the orientation films.

39. The liquid crystal element according to claim 21, wherein the neutralization electrode contacts the liquid crystal directly or via the orientation films.

40. The liquid crystal element according to claim 23, wherein the neutralization electrode contacts the liquid crystal directly or via the orientation films.

41. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, at least on one of the substrates, source signal lines and gate signal lines arranged in a matrix, switching elements arranged at intersections between the source signal lines and the gate signal lines, pixel electrodes connected to the switching elements, common electrodes facing the pixel electrodes, an insulating layer for insulation, etc., of these parts; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the liquid crystal element comprises electrodes for holding a voltage of a predetermined relation to gates, and acting to neutralize ions generated in the liquid crystal.

42. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, at least on one of the substrates, source signal lines and gate signal lines arranged in a matrix, switching elements arranged at intersections between the source signal lines and the gate signal lines, pixel electrodes connected to the switching elements, common electrodes facing the

pixel electrodes, an insulating layer for insulation, etc., of these parts; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the liquid crystal element comprises electrodes for holding a voltage of a predetermined relation to the pixel electrodes, and acting to neutralize ions generated in the liquid crystal.

43. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, at least on one of the substrates, source signal lines and gate signal lines arranged in a matrix, switching elements arranged at intersections between the source signal lines and the gate signal lines, pixel electrodes connected to the switching elements, common electrodes facing the pixel electrodes, an insulating layer for insulation etc. of these parts; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the liquid crystal element comprises electrodes for holding a voltage of a predetermined relation to opposing electrodes, at least of portion of which contact the liquid crystal layer directly, via ~~the~~ an orientation ~~films~~ film not thicker than 500 Å, via a thin film not thicker than ~~1000~~500 Å, or via a film that is transmissive to ions.

44. An in-plane electric field mode liquid crystal element

comprising:

a pair of substrates including, at least on one of the substrates, source signal lines and gate signal lines arranged in a matrix, switching elements arranged at intersections between the source signal lines and the gate signal lines, pixel electrodes connected to the switching elements, common electrodes facing the pixel electrodes, an insulating layer for insulation etc. of these parts; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the liquid crystal element comprises electrodes for holding a voltage of a predetermined relation to at least one of scanning signal lines or gate signal lines, and acting to neutralize ions generated in the liquid crystal.

45. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, at least on one of the substrates, source and gate signal lines as conductive layers, as well as pixel electrodes and common electrodes for generating an in-plane electric field, and further including an insulating film ensuring insulation or the like among these conductive layers; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the liquid crystal element comprises a region made into a thin film, in which the total thickness of a film forming a third layer made of the insulating film and an orientation film

arranged between the conductive layers and the liquid crystal layer is ~~less than 1000~~ not more than 500 Å.

46. The in-plane electric field mode liquid crystal element according to claim 45, wherein the region made into a thin film is located on at least one of the orientation film and the insulating film.

47. The in-plane electric field mode liquid crystal element according to claim 45, wherein the region made into a thin film is on the orientation film or a protective film, and the orientation film or the protective film is made of a resin-based conductive material.

48. The in-plane electric field mode liquid crystal element according to claim 45, wherein the region made into a thin film is located on the pixel electrodes, the common electrodes or the signal lines.

49. The in-plane electric field mode liquid crystal element according to claim 45,

wherein the in-plane electric field mode liquid crystal element includes a resin-based conductive light-blocking film; and

the region made into a thin film is located on the conductive light-blocking film.

50. The in-plane electric field mode liquid crystal element according to claim 49, wherein the region made into a thin film is

formed on a substrate opposing the substrate on which the pixel electrodes~~, etc.,~~ are formed.

51. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on at least one of the substrates, as conductive layers, signal lines, storage capacity electrodes, and pixel electrodes and common electrodes for generating an in-plane electric field, and an insulating film for insulating, etc., these conductive layers from one another; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein a film forming a third layer made of the insulating film and the orientation films, etc., arranged between the conductive layer and the liquid crystal is, in a predetermined location, only the orientation film of a film thickness of ~~no~~ not more than ~~1000~~ 500 Å, a thin film of not more than 500 Å, a film transmissive to ions, or has not been formed in the first place.

52. The in-plane electric field mode liquid crystal element according to claim 51, wherein the predetermined location at which the liquid crystal layer and the conductive layer are in direct contact is on the pixel electrodes, the common electrodes, the storage capacity electrodes, or the signal lines.

53. The in-plane electric field mode liquid crystal element according to claim 51, wherein the in-plane electric field mode

liquid crystal element comprises a resin-based conductive light-blocking film, and the predetermined location at which the liquid crystal layer and the conductive layer are in direct contact is on the conductive light-blocking film.

54. The in-plane electric field mode liquid crystal element according to claim 53, wherein the region the region made into a thin film is formed on a substrate opposing the substrate on which the pixel electrodes, etc., are formed.

55. ~~A~~ An in-plane electric field mode liquid crystal element, comprising:

a pair of substrates including, on one of the substrates, pixel electrodes, as well as opposing electrodes and signal lines not on the same layer as the pixel electrodes, and an insulating film for insulating, etc., these from one another; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the insulating film is formed on either the pixel electrodes or the opposing electrodes, and is not formed at all on the other of the two.

56. The in-plane electric field mode liquid crystal element according to claim 55, wherein the insulating film is formed along the direction of rubbing in the in-plane electric field mode liquid crystal element.

57. The in-plane electric field mode liquid crystal element according to claim 45, wherein the in-plane electric field mode liquid crystal element ~~is a low specific resistance liquid crystal layer using~~ uses a liquid crystal with a specific resistance ~~smaller than 10^{13} Ω·cm~~ of 10^{12} to 10^{13} Ω · cm.

58. The in-plane electric field mode liquid crystal element according to claim 50, wherein the in-plane electric field mode liquid crystal element ~~is a low specific resistance liquid crystal layer using~~ uses a liquid crystal ~~with~~ having a specific resistance ~~smaller than 10^{13} Ω·cm~~ of 10^{12} to 10^{13} Ω · cm.

59. The in-plane electric field mode liquid crystal element according to claim 54, wherein the in-plane electric field mode liquid crystal element ~~is a low specific resistance liquid crystal layer using~~ uses a liquid crystal ~~with~~ having a specific resistance ~~smaller than 10^{13} Ω·cm~~ of 10^{12} to 10^{13} Ω · cm.

60. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on one of the substrates, pixel electrodes, common electrodes, as well as signal lines and scanning lines corresponding to the pixel electrodes and the common electrodes, and an insulating layer;

wherein liquid crystal is sandwiched via orientation films provided on the inner side of the two substrates; and

wherein the other substrate comprises a conductive

layer via the orientation films in a striped shape.

65. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates, in which on one of the substrates is formed pixel electrodes and common electrodes, ~~as well as~~ and signal lines and scanning lines corresponding to the pixel electrodes and the common electrodes;

wherein liquid crystal is sandwiched via orientation films provided on the inner side of the two substrates; ~~and~~

wherein the in-plane electric field mode liquid crystal element comprises, on the other substrate, a conductive light-blocking film extending in the direction of the signal lines and ~~in~~ the direction of the scanning lines, and ~~regions thereof~~ there are regions, arranged in a grid, that are in contact with the liquid crystal layer via a thin film layer of ~~1000~~not more than 500 Å or a film transmissive to ions arranged~~ in a grid shape~~.

66. The in-plane electric field mode liquid crystal element according to claim 60, wherein the conductive portion of the conductive light-blocking film is made of Cr, Ti, or a conductive resin.

67. The in-plane electric field mode liquid crystal element according to claim 60, wherein the conductive light-blocking film is a light-blocking film made of a conductive resin.

68. The in-plane electric field mode liquid crystal element according to claim 66, wherein columns are formed at a predetermined site as spacers for holding a fixed spacing between the substrates of the in-plane electric field mode liquid crystal element.

69. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on at least one of the substrates, pixel electrodes, common electrodes, signal lines, scanning lines, and an insulating film for insulating, etc., these portions; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein no insulating film is formed on at least a portion of the liquid crystal side of at least one of the pixel electrodes, the common electrodes, and the signal lines, whereby these electrodes or lines are insulating film open electrodes contacting the liquid crystal directly ~~or via the orientation film~~; and

wherein the in-plane electric field mode liquid crystal element comprises, on the substrate side on which the pixel electrodes and the common electrodes have not been formed, a neutralization electrode for neutralizing ionic charges in the liquid crystal layer by sites where the insulating film to the liquid crystal layer has not been formed at all or the insulating film to the liquid crystal layer has at least partially not been formed.

70. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on at least one of the substrates, pixel electrodes, common electrodes, signal lines, scanning lines, and an insulating film for insulating, etc., these portions; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the pixel electrodes are open pixel electrodes, in which no insulating film has been formed at all, so that at these portions the pixel electrodes contact the liquid crystal directly or via only an orientation film of not more than 500 Å; and

wherein the in-plane electric field mode liquid crystal element comprises, on the substrate side on which the pixel electrodes, etc., have not been formed, a neutralization electrode for neutralizing ionic charges in the liquid crystal layer by sites where the insulating film to the liquid crystal layer has not been formed at all or the insulating film to the liquid crystal layer has at least partially not been formed.

71. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on at least one of the substrates, pixel electrodes, common electrodes, signal lines, scanning lines, and an insulating film for insulating, etc., these portions; and

a liquid crystal layer sandwiched via orientation films

provided in principle on the inner side of the two substrates;

wherein no insulating film has been formed at all on the common electrodes, so that at these portions the common electrodes are open common electrodes, in which ~~no insulating film has been formed at all, so that at these portions the common~~ the pixel electrodes contact the liquid crystal directly or via only an orientation film of not more than 500 Å; and

wherein the in-plane electric field mode liquid crystal element comprises, on the substrate side on which the ~~pixel~~ common electrodes, etc., have not been formed, a neutralization electrode for neutralizing ionic charges in the liquid crystal layer by sites where the insulating film to the liquid crystal layer has not been formed at all or the insulating film to the liquid crystal layer has at least partially not been formed.

72. An in-plane electric field mode liquid crystal element comprising:

a pair of substrates including, on at least one of the substrates, pixel electrodes, common electrodes, signal lines, scanning lines, and an insulating film for insulating, etc., these portions; and

a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates;

wherein the pixel electrodes and the common electrodes are, respectively, open pixel electrodes and open common electrodes, in which no insulating film to the liquid crystal layer has been formed at all, so that at these portions they contact the liquid crystal

directly or via only an orientation film of not more than 500 Å; and

wherein the in-plane electric field mode liquid crystal element comprises, on the substrate side on which the pixel electrodes and common electrodes have not been formed, a neutralization electrode for neutralizing ionic charges in the liquid crystal layer by sites where the insulating film to the liquid crystal layer has not been formed at all or the insulating film to the liquid crystal layer has at least partially not been formed.

73. The in-plane electric field mode liquid crystal element according to claim 69, wherein the liquid crystal layer of the in-plane electric field mode liquid crystal element ~~is a low specific resistance liquid crystal layer using~~ uses a liquid crystal with a specific resistance of ~~less than 10^{13} Ω•cm~~ 10^{12} to 10^{13} Ω • cm.

74. The in-plane electric field mode liquid crystal element according to claim 69, including a positive potential applying means for applying, to the neutralization electrode, a positive potential with respect to a minimum voltage level of the scanning line.

75. The in-plane electric field mode liquid crystal element according to claim 69, wherein the neutralization electrode is an equipotential neutralization electrode that has been set to the same potential as the common electrode.

76. The in-plane electric field mode liquid crystal element

according to claim 69, wherein the neutralization electrode is a light-blocking film combined neutralization electrode that also serves as a light-blocking film.

77. The in-plane electric field mode liquid crystal element according to claim 69, wherein the neutralization electrode is a color filter combined neutralization electrode that also serves as a color filter.

78. The in-plane electric field mode liquid crystal element according to claim 69, wherein the insulating film has not been formed on a top portion of one of the pixel electrodes, the common electrodes, or the signal electrodes, so that the portion without the insulating film faces the liquid crystal layer via only the orientation film; and

wherein the orientation film is made of a resin-based conductive substance.

79. The in-plane electric field mode liquid crystal element according to claim 76, comprising a positive potential applying means for applying, to the neutralization electrode, a positive potential with respect to a minimum voltage level of the scanning line.

80. The in-plane electric field mode liquid crystal element according to claim 77, comprising a positive potential applying means for applying, to the neutralization electrode, a positive

potential with respect to a minimum voltage level of the scanning line.

81. The in-plane electric field mode liquid crystal element according to claim 76, wherein the neutralization electrode is an equipotential neutralization electrode that has been set to the same potential as the common electrode.

82. The in-plane electric field mode liquid crystal element according to claim 77, wherein the neutralization electrode is an equipotential neutralization electrode that has been set to the same potential as the common electrode.

83. A method for manufacturing an in-plane electric field mode liquid crystal element having a pair of substrates including, on at least one of the substrates, pixel electrodes for generating an in-plane electric field, common electrodes, and an insulating film for insulating, etc., these electrodes from one another, and a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates; the method for manufacturing ~~a~~ an in-plane electric field mode liquid crystal element, comprising:

an orientation film removal step of removing a predetermined portion of the orientation film once formed on the inner side of the two substrates.

84. A method for manufacturing an in-plane electric field mode

liquid crystal element having a pair of substrates including, on at least one of the substrates, pixel electrodes for generating an in-plane electric field, common electrodes, and an insulating film for insulating, etc., these electrodes from one another, and a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates; the method for manufacturing ~~a~~ an in-plane electric field mode liquid crystal element, comprising:

an orientation film removal step of removal, by etching, of a predetermined portion of the orientation film once formed on the inner side of the two substrates; and

an orientation step of performing an orientation process to the remaining orientation film.

85. A method for manufacturing an in-plane electric field mode liquid crystal element having a pair of substrates including, on at least one of the substrates, pixel electrodes for generating an in-plane electric field, common electrodes, and an insulating film for insulating, etc., these electrodes from one another, and a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates; the method for manufacturing ~~a~~ an in-plane electric field mode liquid crystal element, comprising:

a stripping step of stripping, by rubbing, a predetermined portion of the orientation film on the electrodes or the lines once formed on the inner side of the two substrates.

86. The method for manufacturing ~~a~~ an in-plane electric field mode liquid crystal element according to claim 85, wherein the stripping step is a push rubbing stripping step wherein the pushing amount during rubbing is at least 0.5 mm.

87. An in-plane electric field mode liquid crystal element including a pair of substrates on which are formed, on at least one of the substrates, pixel electrodes, common electrodes, signal lines and scanning lines corresponding to these electrodes, and an insulating film; and a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates, comprising:

a conductive light-blocking film formed on the other substrate; and

an electrical connection portion for electrically connecting the light-blocking film to the common electrodes, the pixel electrodes, the scanning lines, or the signal lines.

88. A method for manufacturing an in-plane electric field mode liquid crystal element including a pair of substrates on which are formed, on at least one of the substrates, pixel electrodes, common electrodes, signal lines and scanning lines corresponding to these electrodes, and an insulating film for insulating;

and a liquid crystal layer sandwiched via orientation films provided in principle on the inner side of the two substrates, the method for manufacturing an in-plane electric field mode liquid crystal element comprising:

a light-blocking film formation step of forming a light-blocking film made of a conductive substance at a predetermined location on the other substrate;

an over-coating layer material selection step of selecting a photosensitive material as the material of an over-coating layer of the light-blocking film;

an over-coating layer formation step of forming ~~the~~ an over-coating layer with the selected photosensitive material; and

an over-coating layer portion stripped portion formation step using photolithography of forming, by photolithography, on the over-coating material layer on the conductive light-blocking film a region in which there is no over-coating layer on the light-blocking film.

89. The method for manufacturing an in-plane electric field mode liquid crystal element according to claim 88, comprising:

an equipotential conductive portion formation step of forming, onto the formed conductive light-blocking film, an electrical connection portion for applying the same potential as that of the common electrode.

90. A method for manufacturing an in-plane electric field mode liquid crystal element, comprising:

a first conductive layer formation step of forming, at a predetermined location on a first substrate, an opposing electrode and a scanning line also serving as a gate of a transistor made of a metal layer;

a first insulating film formation step of forming a first insulating film on the scanning line and the opposing electrode that ~~have been~~ are formed;

a semiconductor layer formation step of forming a semiconductor layer at a predetermined location;

a second conductive layer formation step of forming a signal line and a pixel electrode at predetermined locations; and

a second insulating film formation step of forming a second insulating film only on a switching element made of the semiconductor layer formed at the predetermined location.

91. A method for manufacturing an in-plane electric field mode liquid crystal element, comprising:

a first conductive layer formation step of forming, at a predetermined location on a first substrate, a scanning line and an opposing electrode also serving as a gate of a transistor made of a metal layer;

a first insulating film formation step of forming a first insulating film on the scanning line and the opposing electrode that are formed;

a semiconductor formation step of forming a semiconductor layer at a predetermined location;

a second conductive layer formation step of forming a signal line and a pixel electrode at predetermined locations; and

a second insulating film formation step of forming a second insulating film only on the signal line and on a switching element made of the semiconductor layer formed at the predetermined